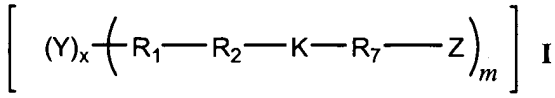
5

THAT WHICH IS CLAIMED:

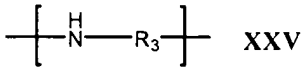
1. An alkyl-linked nucleotide composition comprising a general formula:



I

10 wherein Y is a solid support, a tag, or a protective group; x = 0 or 1; R_1 is a covalent bond between Y and R_2, or R_1 is an acyl group, a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl group, a substituted or a non-substituted aryl group, a substituted or a non-substituted heteroaryl group, or a 15 combination thereof; R_2 is a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl, a substituted or a non-substituted heteroaryl group, or a combination thereof; K is a heteroatom; R_7 is $(P)_n$ where P is a phosphate or thiophosphate and n is at least one or R_7 is a phosphate group mimic, Z is a 20 nucleoside or nucleoside derivative; and m is at least one.

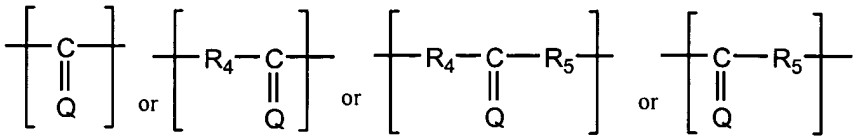
2. The alkyl-linked nucleotide composition of claim 1, wherein R_2 comprises a general formula:



XXV

25 wherein R_3 is a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl, a substituted or a non-substituted heteroaryl group, or a combination thereof.

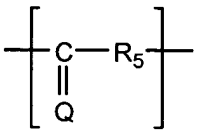
30 3. The alkyl-linked nucleotide composition of claim 2, wherein R_1 comprises:



XXIX XXVI XXVII XXVIII

wherein Q = O or NH_2+; R_4 is a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl group, a substituted or a non-substituted aryl group, a substituted or a non-substituted heteroaryl group, or a combination thereof; and R_5 is a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl group, a substituted or a non-substituted aryl group, a substituted or a non-substituted heteroaryl group, or a combination thereof.

4. The alkyl-linked nucleotide composition of claim 3, wherein R_1 comprises a general formula:



XXVIII

5. The alkyl-linked nucleotide composition of claim 1, wherein the heteroatom (K) is a nitrogen atom, an oxygen atom or a sulfur atom.

6. The alkyl-linked nucleotide composition of claim 1, wherein the heteroatom (K) is a nitrogen atom.

7. The alkyl-linked nucleotide composition of claim 1, wherein Y is a solid support.

8. The alkyl-linked nucleotide composition of claim 7, wherein the composition is a nucleotide affinity medium.

9. The nucleotide affinity medium of claim 8, wherein the solid support includes at least one member selected from the group consisting of an acrylamide, agarose, methacrylate, cellulose, nylon, silica, glass, ceramic, a magnetized particle, nitrocellulose, polystyrene, a thermoresponsive polymer, and derivatives thereof.

10. The nucleotide affinity medium of claim 9, wherein the solid support is a beaded agarose.

11. The nucleotide affinity medium of claim 8, wherein the solid support has a loading of an alkyl-linked nucleotide in a range of 5-25%.

12. The nucleotide affinity medium of claim 8, wherein the solid support has a loading of an alkyl-linked nucleotide in a range of 20-50%.

13. The nucleotide affinity medium of claim 8, wherein the solid support has a loading of an alkyl-linked nucleotide in a range of 40-65%.

14. The nucleotide affinity medium of claim 8, wherein the solid support has a loading of an alkyl-linked nucleotide in a range of 60-80%.

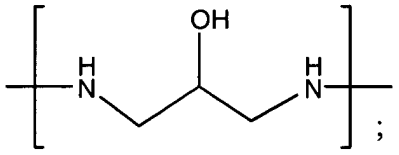
15. The nucleotide affinity medium of claim 8, wherein the solid support has a loading of an alkyl-linked nucleotide in a range of 75-100%.

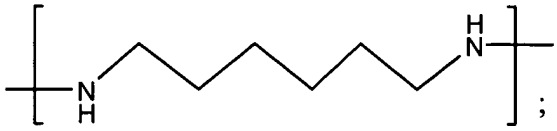
16. The alkyl-linked nucleotide composition of claim 1, wherein the tag is biotin.

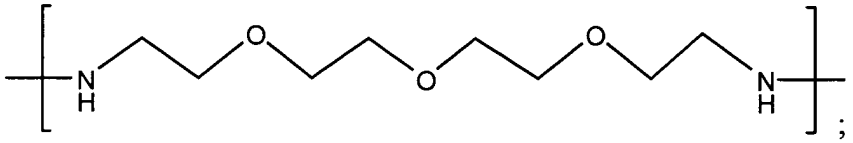
17. The alkyl-linked nucleotide composition of claim 1 wherein R_7 is $(P)_n$.

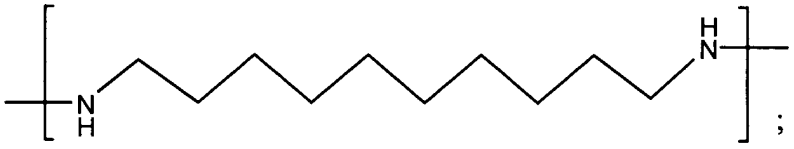
18. The alkyl-linked nucleotide composition of claim 17, wherein n is 1, 2, 3, or 4.

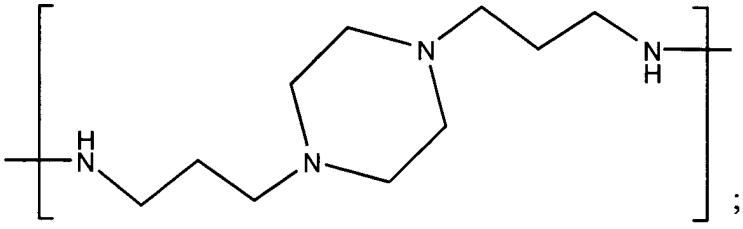
19. The alkyl-linked nucleotide composition of claim 1, wherein R_2 is a linker selected from the group consisting of:

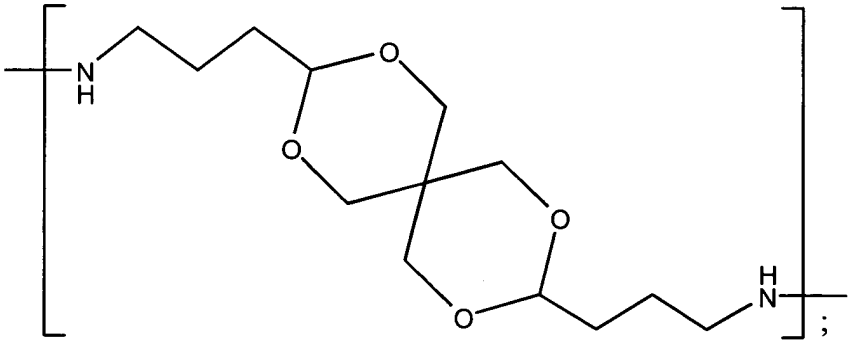


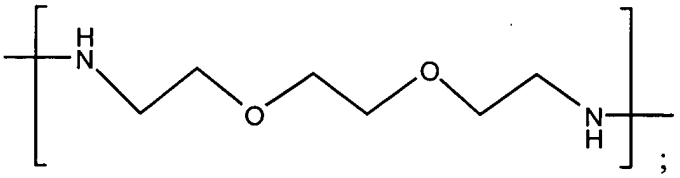


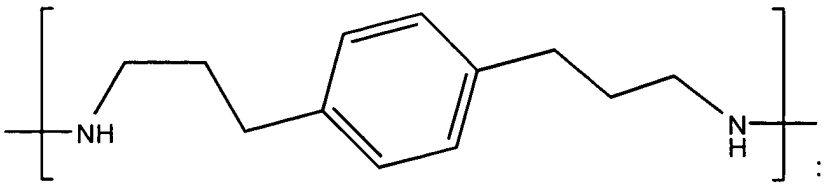








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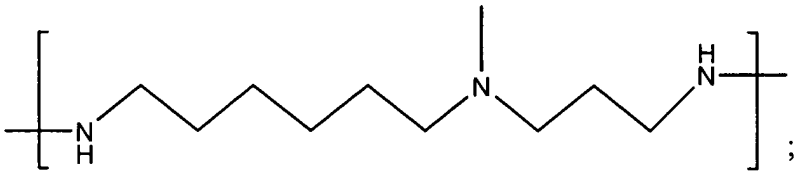
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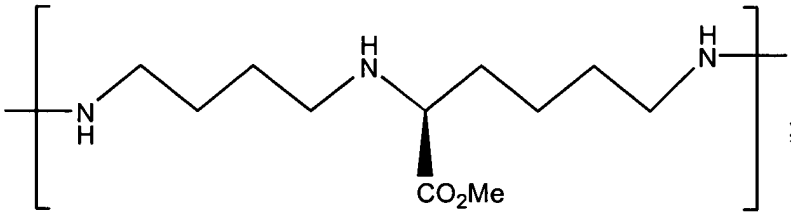
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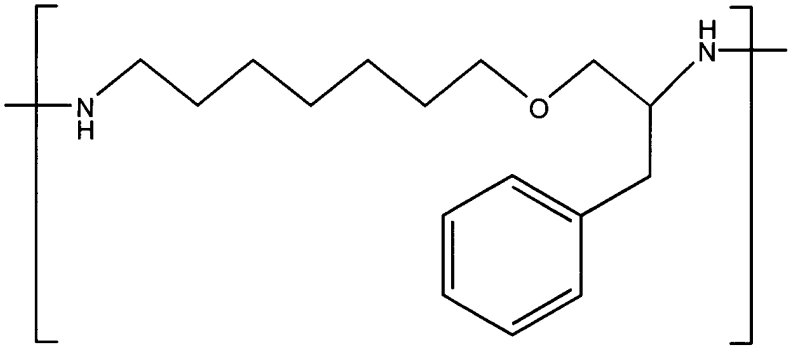
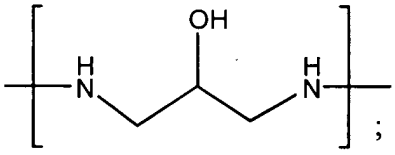

;

20. The alkyl-linked nucleotide composition of claim 1, wherein if m is more than one, then R_2 is at least one linker selected from the group consisting of: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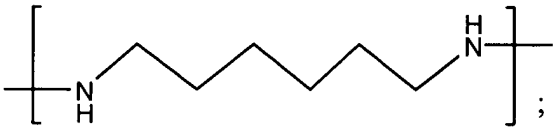
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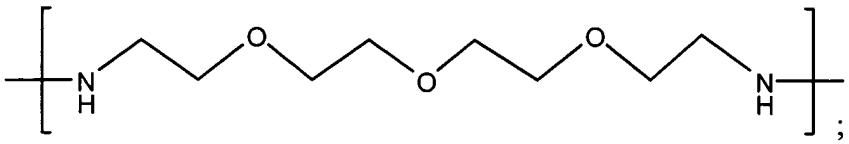

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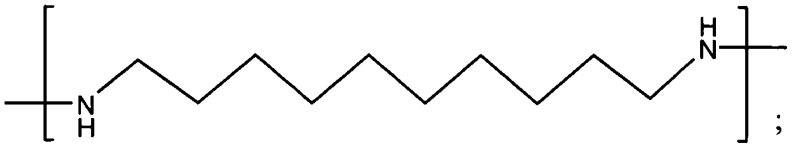

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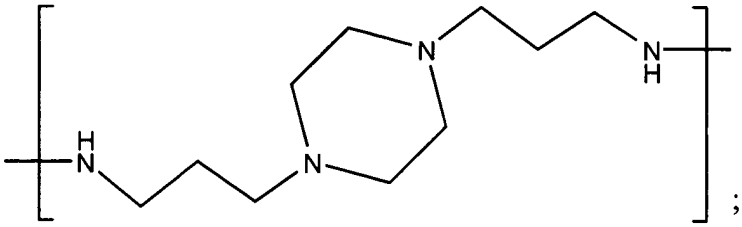

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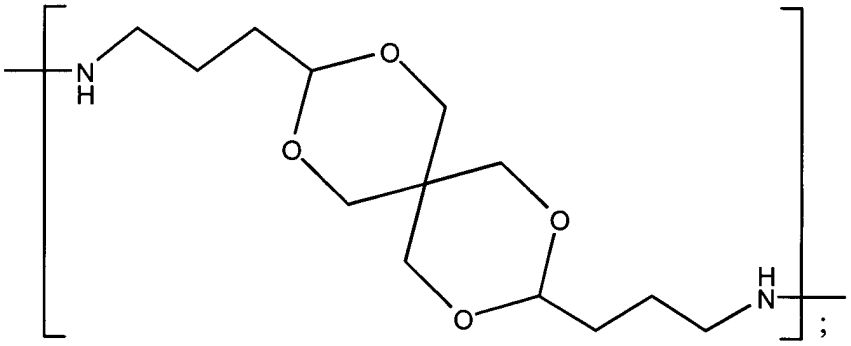

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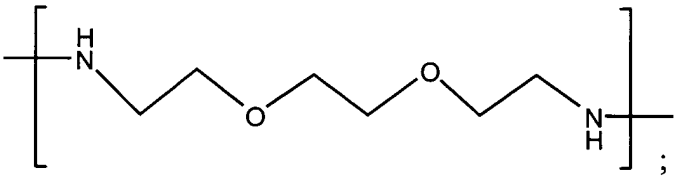

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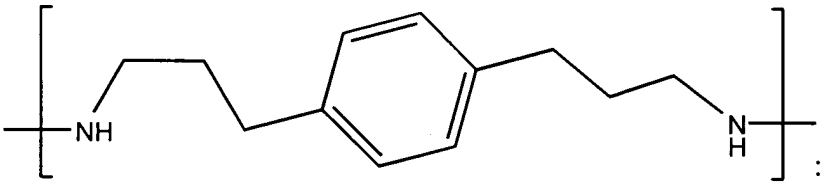

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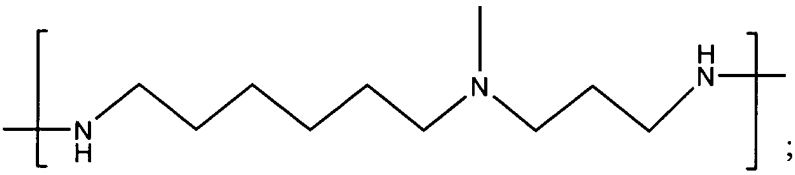

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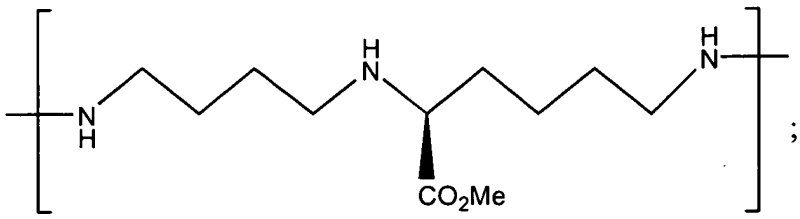
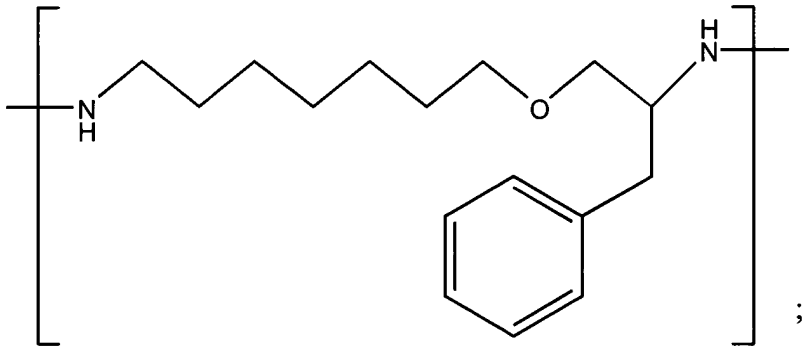
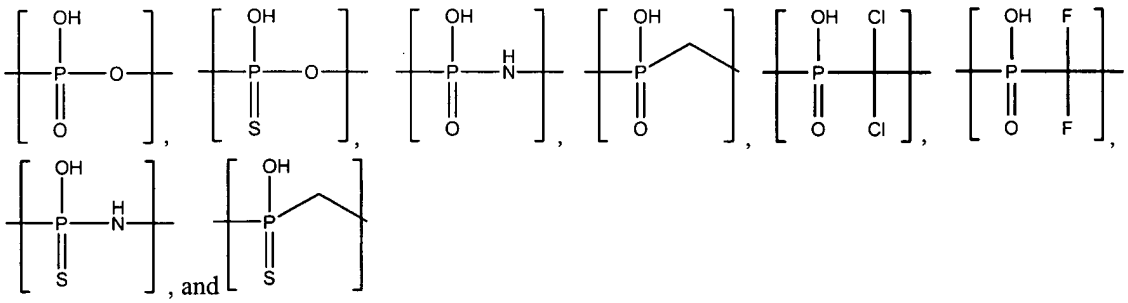


; and



;

21. The alkyl-linked nucleotide composition of claim 17, wherein P is selected from the group consisting of

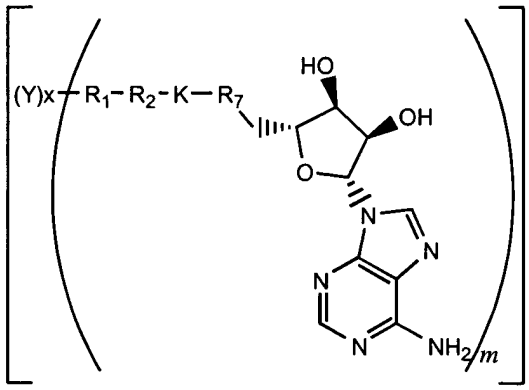


, and

and an ionized variant or a salt thereof.

22. The alkyl-linked nucleotide composition of claim 1, wherein the nucleoside is selected from the group consisting of adenosine, guanosine, cytidine, thymidine, and uridine, or an analog thereof.

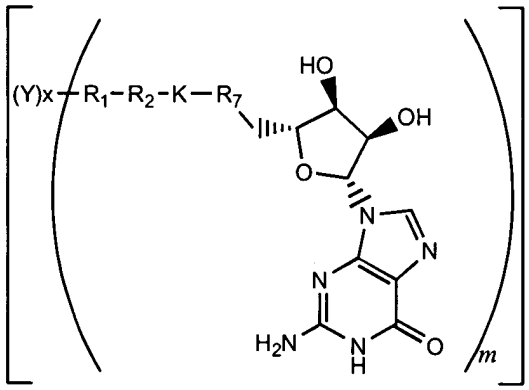
23. The alkyl-linked nucleotide composition of claim 22, wherein the nucleoside is an adenosine, said alkyl-linked nucleotide composition comprising a general structure:



II

or an ionized variant or a salt thereof.

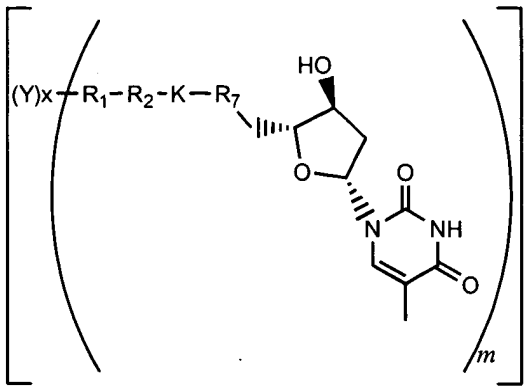
24. The alkyl-linked nucleotide composition of claim 22, wherein the nucleoside is a guanosine, said alkyl-linked nucleotide composition comprising a general structure:



III

or an ionized variant or a salt thereof.

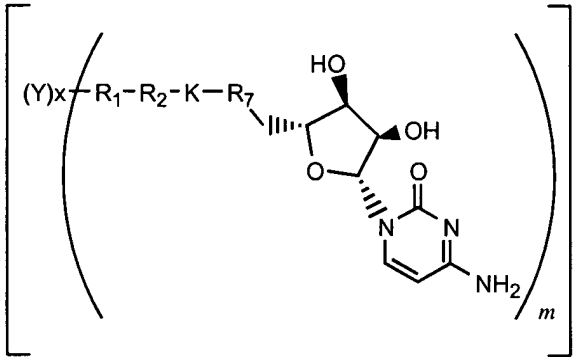
25. The alkyl-linked nucleotide composition of claim 22, wherein the nucleoside is a thymidine, said alkyl-linked nucleotide composition comprising a general structure:



IV

or an ionized variant or a salt thereof.

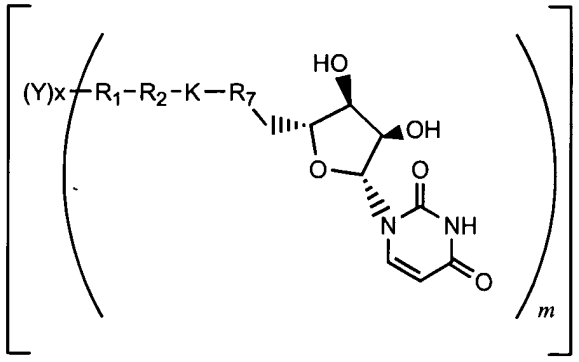
26. The alkyl-linked nucleotide composition of claim 22, wherein the nucleoside is a cytidine, said alkyl-linked nucleotide composition comprising a general structure:



V

or an ionized variant or a salt thereof.

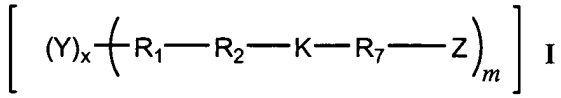
27. The alkyl-linked nucleotide composition of claim 22, wherein the nucleoside is a uridine, said alkyl-linked nucleotide composition comprising a general structure:



VI

or an ionized variant or a salt thereof.

28. A method for synthesizing a nucleotide affinity medium comprising a general formula:



I

comprising the steps of:

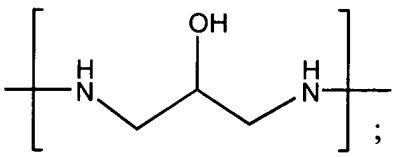
a) coupling at least one linker to a solid support or tag in a suitable coupling buffer, wherein said linker is R_2 or a combination of R_1 and R_2;

b) end-capping at least a portion of reactive sites remaining on said solid support or tag after said coupling step; and

c) reacting a terminal phosphate or thiophosphate group of a nucleotide with said linker coupled to said solid support or tag,

wherein Y is a solid support or a tag; x = 1; R_1 is a covalent bond between Y and R_2, or R_1 is an acyl group, a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl group, a substituted or a non-substituted aryl group, a substituted or a non-substituted heteroaryl group, or a combination thereof; R_2 is a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl, a substituted or a non-substituted heteroaryl group, or a combination thereof; K is a heteroatom; R7 is $(P)_n$ where P is a phosphate or thiophosphate and n is at least one or R_7 is a phosphate group mimic; Z is a nucleoside; and m is at least one.

29. The method of claim 28, wherein R_2 is a linker selected from the group consisting of:



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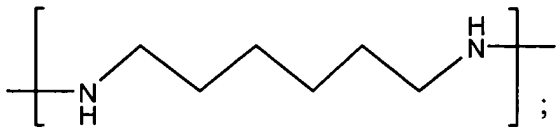
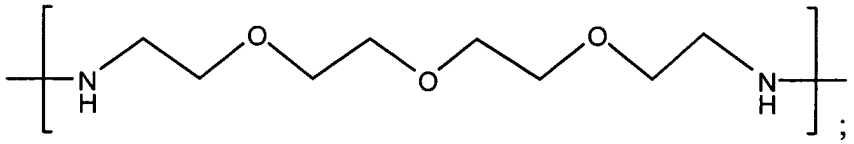
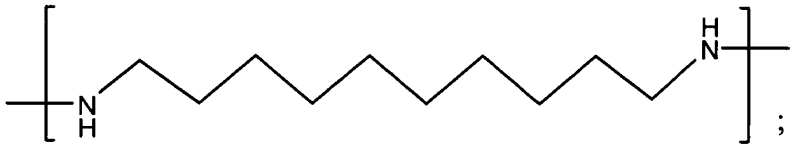
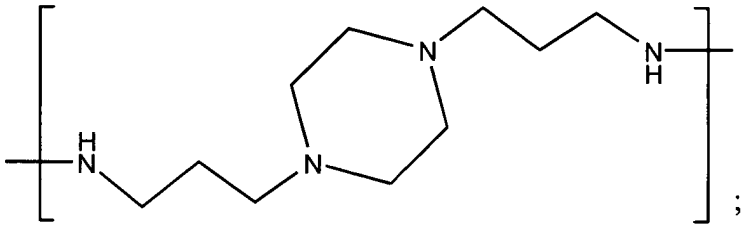
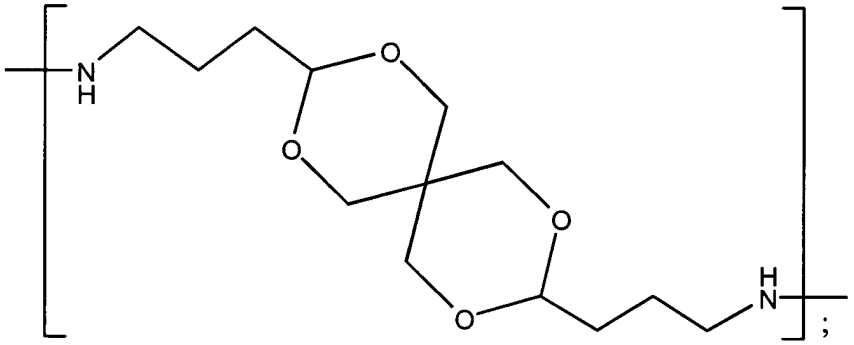
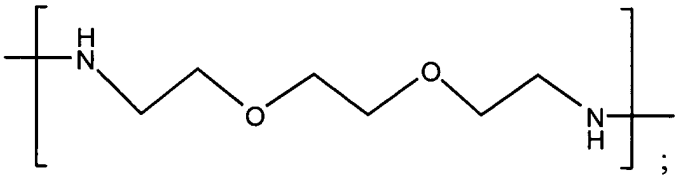


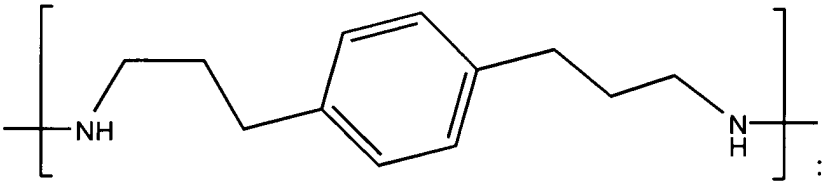


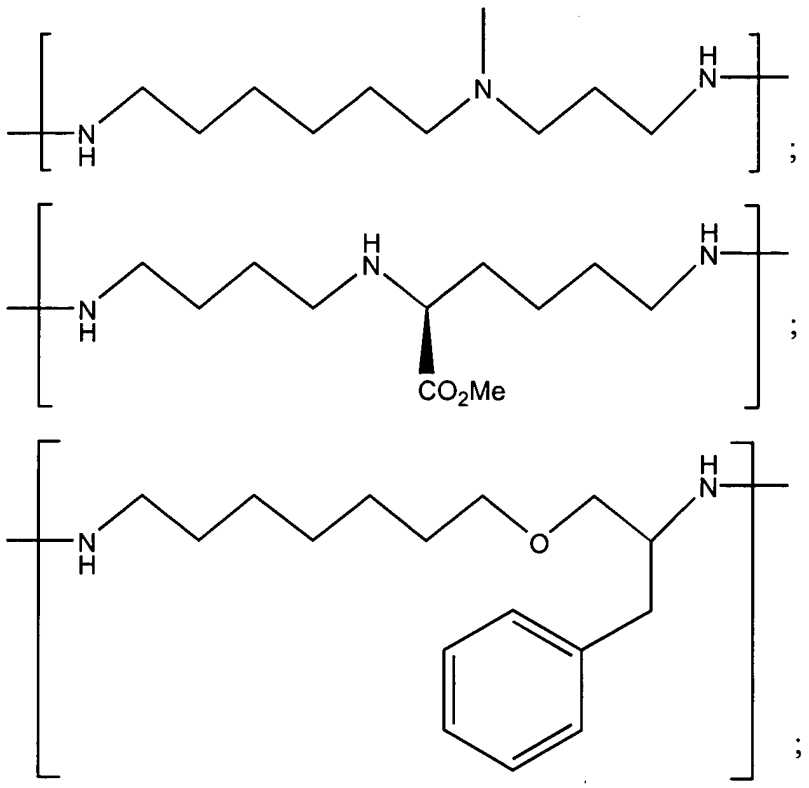




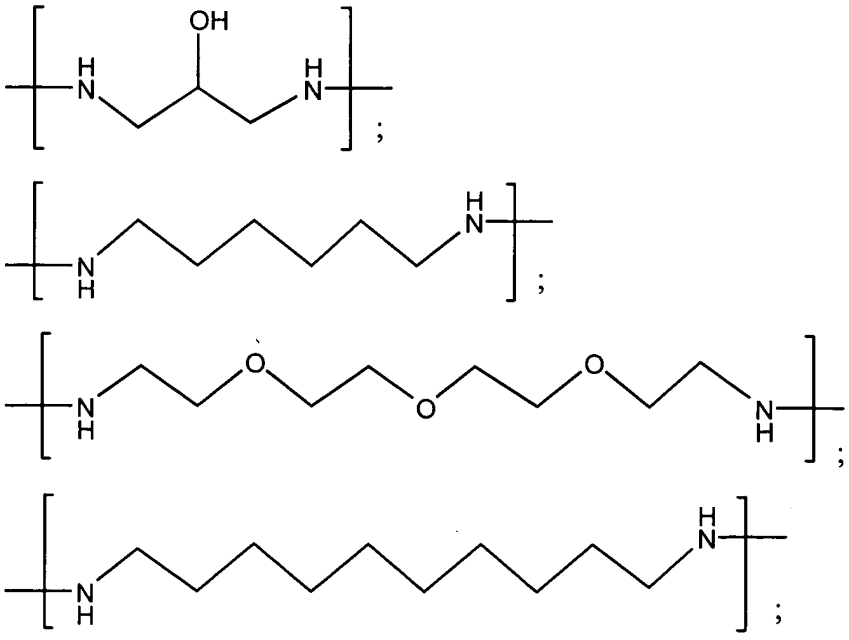








30. The method of claim 28, wherein if m is more than one, then R_2 is at least one linker selected from the group consisting of:



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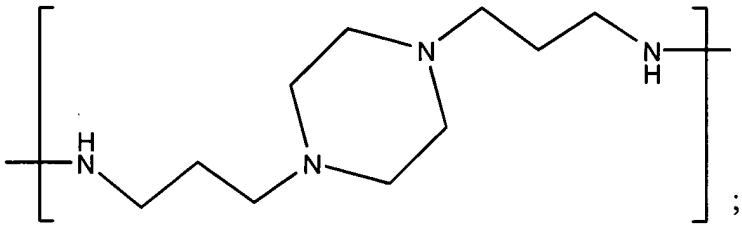

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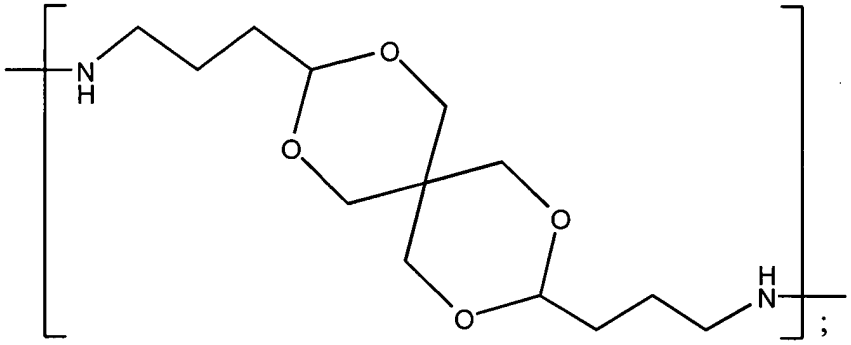

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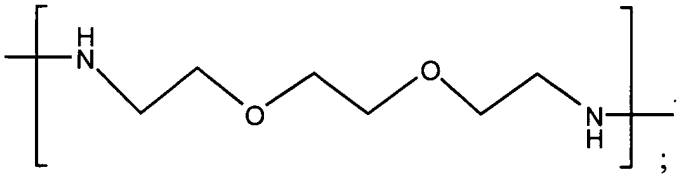

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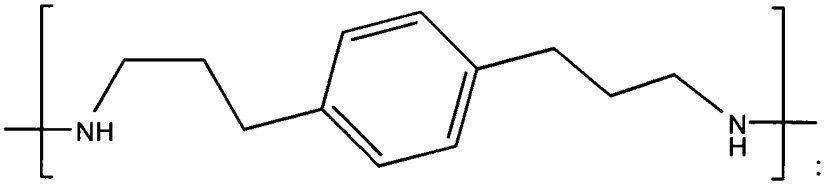

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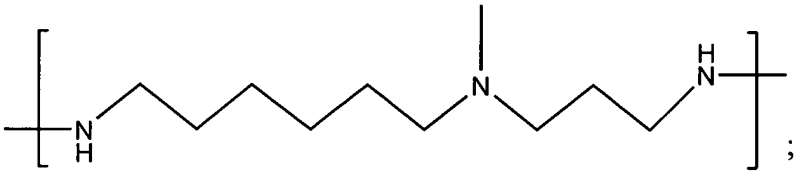

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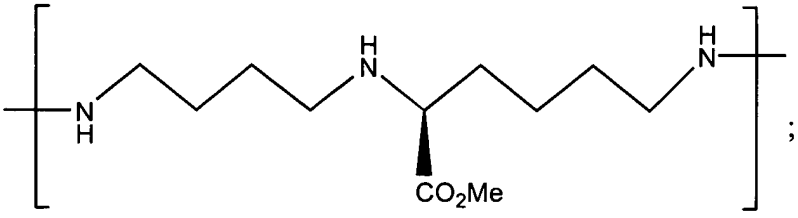

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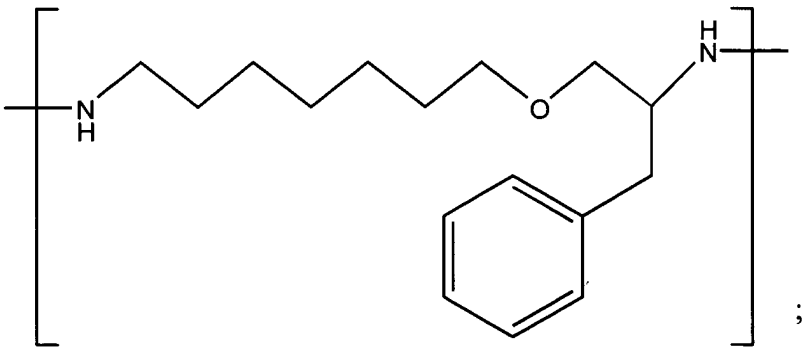

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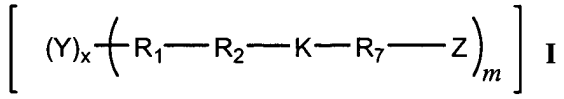
31. A method for screening a test compound comprising the steps of:

a) contacting a proteome with a nucleotide affinity medium comprising a general formula:



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wherein Y is a solid support or a tag; x = 1; R_1 is a covalent bond between Y and R_2, or R_1 is an acyl group, a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl group, a substituted or a non-substituted aryl group, a substituted or a non-substituted heteroaryl group, or a combination thereof; R_2 is a substituted or a non-substituted alkyl group, a substituted or a non-substituted cycloalkyl group, a substituted or a non-substituted heteroalkyl group, a substituted or a non-substituted heterocycloalkyl, a substituted or a non-substituted heteroaryl group, or a combination thereof; K is a heteroatom; R_7 is $(P)_n$ where P is a phosphate or thiophosphate and n is at least one or R_7 is a phosphate group mimic, Z is a nucleotide or nucleoside derivative; and m is at least one.

b) washing the nucleotide affinity medium with a buffer, whereby non-specifically bound components of the proteome are eluted from the nucleotide affinity medium and specific components of the proteome remain bound to the nucleotide affinity medium;

c) contacting the nucleotide affinity medium bound with specific components of the proteome with at least one test compound;

d) eluting from the nucleotide affinity medium components of the proteome that are specifically displaced by the test compound; and

e) identifying the components of the proteome that are specifically displaced by the test compound from the nucleotide affinity medium.